Supplementary Online Content

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eReferences

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. List and Brief Descriptions of Administrative Data Systems in the Army STARRS Historical Administrative Data Study (HADS) Included in the Current Study

Database Acronym	Description
DMDC/CTS	DEFENSE MANPOWER DATA CENTER (DMDC) / CONTINGENCY TRACKING SYSTEM (CTS): Collection of activation, mobilization, and deployment data. Provides information to DoD decision makers and includes a CTS Deployment File used for tracking the location of deployed personnel.
DMDC/Master Personnel & DMDC/Transaction files	DEFENSE MANPOWER DATA CENTER (DMDC) / MASTER PERSONNEL & TRANSACTION FILES: The Active Duty Master File provides an inventory of all individuals on active duty (excluding reservists on active duty for training) at a point in time. It is a standardized and centralized database of present and past members of the active duty force. Personal data elements include social security number, education level, home of record, date of birth, marital status, number of dependents, race, ethnic group, and name. Military data elements include Service, pay grade, Armed Forces Qualification Test percentile (enlisted only), source of commission (officers only), military primary duty and secondary occupation, Unit Identification Code, months of service, duty location, Estimated Termination of Service date, basic active service date, date of current rank, pay entry base date, foreign language ability, and major command code.
DODSER	DEPARTMENT OF DEFENSE SUICIDE EVENT REPORT (DODSER): Provides risk and protective factor information for suicide events. This file contains non-fatal attempts and completed suicide cases.
MDR	MILITARY HEALTH SYSTEM DATA REPOSITORY (MDR): This database contains information about medical, dental, pharmaceutical, and ancillary claims data for both in network and purchased care as well as both inpatient and outpatient treatment. Data are collected on both Army personnel and their beneficiaries.
TMDS	THEATER MEDICAL DATA STORE (TMDS): Used to track, analyze, view and manage Soldier medical treatment information recorded in the theater of operations. Features of TMDS: accessibility and visibility of service members' deployed medical records, outpatient and inpatient treatment records created in theater facilities, treatment records from other applications, reports on movement of patients, patient status and injury/illnesses.
TRAC2ES	TRANSCOM REGULATING AND COMMAND AND CONTROL EVACUATION SYSTEM (TRAC2ES): A tracking system for all medical transfers across the world for all DOD services.

eTable 2. Categories of Suicide Attempt Method Developed from Department of Defense Suicide Event Report (DoDSER) Records and E950-E958 Diagnostic Codes from the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-18 CM).

		Method Codes	
Method Category		**DoDSER (Year)**	**ICD-9-CM**
Firearm		Firearm/gun (2004) Firearm/gun, military issue or duty weapon (2005–2009) Firearm/gun, other than military issue (2005–2009)	**E955 Suicide and self-inflicted injury by firearms, air guns and explosives:** E955.0 Handgun E955.1 Shotgun E955.2 Hunting rifle E955.3 Military firearms E955.4 Other and unspecified firearm E955.6 Air gun E955.7 Paintball gun E955.9 Unspecified *Excluded: E955.5 Explosives
Other		Overdose (2004) Overdose (medication, drugs, or alcohol) (2005, 2006) Drugs (2007–2009) Alcohol (2007–2009) Poisoning by vehicle exhaust (2004–2007) Gas, vapor poisoning by vehicle exhaust (2008, 2009) Poisoning by utility gas (2004–2007) Gas, vapor poisoning by utility (or other) gas (2008, 2009) Poisoning by solid or liquid substance (not medication) (2004–2006) Solvents, pesticides, and other agricultural chemicals (2007–2009) Hanging, strangulation, or suffocation (2004–2006) Hanging (2007–2009) Submersion (drowning) (2004–2006) Drowning (2007–2009) Fire, steam, etc. (2007–2009) Cutting or piercing instrument (2004–	**E950: Suicide and self-inflicted poisoning by solid or liquid substances:** E950.0 Analgesics, antipyretics, and antirheumatics E950.1 Barbiturates E950.2 Other sedatives and hypnotics E950.3 Tranquilizers and other psychotropic agents E950.4 Other specified drugs and medicinal substances E950.5 Unspecified drug or medicinal substance E950.6 Agricultural and horticultural chemical and pharmaceutical preparations other than plant foods and fertilizers E950.7 Corrosive and caustic substances E950.8 Arsenic and its compounds E950.9 Other and unspecified solid and liquid substances **E951 Suicide and self-inflicted poisoning by gases in domestic use:** E951.0 Gas distributed by pipeline; E951.1 Liquefied petroleum gas distributed in mobile containers;

		2006) Sharp or blunt object (2007–2009) Jumping from high place (2004–2009) Lying in front of a moving object (2007–2009) Motor vehicle crash (2004–2006) Crashing a motor vehicle (2007–2009) Other (2004–2009)	E951.8 Other utility gas **E952 Suicide and self-inflicted poisoning by other gases and vapors:** E952.0 Motor vehicle exhaust gas E952.1 Other carbon monoxide E952.8 Other specified gases and vapors E952.9 Unspecified gases and vapors **E953 Suicide and self-inflicted injury by hanging, strangulation, and suffocation:** E953.0 Hanging E953.1 Suffocation by plastic bag E953.8 Other specified means E953.9 Unspecified means **E954 Suicide and self-inflicted injury by submersion [drowning]** **E956 Suicide and self-inflicted injury by cutting and piercing instrument** **E957 Suicide and self-inflicted injuries by jumping from high place:** E957.0 Residential premises E957.1 Other man-made structures E957.2 Natural sites E957.9 Unspecified **E958 Suicide and self-inflicted injury by other and unspecified means:** E958.0 Jumping or lying before moving object E958.1 Burns, fire E958.2 Scald E958.3 Extremes of cold E958.4 Electrocution E958.5 Crashing of motor vehicle E958.6 Crashing of aircraft E958.7 Caustic substances, except poisoning E958.8 Other specified means E958.9 Unspecified means

eTable 3. International Classification of Diseases, Ninth Revision–Clinical Modification (ICD-9-CM) Codes Used to Identify Mental Disorders	
Included Mental Health Diagnoses	**ICD-9-CM Codes**
Depression (Major Depression/ Dysthymic Disorder /Neurasthenia/ Depression NOS)	296.2, .20, .21, .22, .23, .24, .25, .26, .3, .30, .31, .32, .33, .34, .35, .36 296.82, .90, .99 300.4, .5 309.0, .1 311, .0, .1 313.1
Post-Traumatic Stress Disorder	309.81
Substance Use Disorder (Alcohol Induced Mental Disorders/ Alcohol Dependence/ Alcohol Abuse/ Drug Induced Mental Disorders/ Non-Dependent Drug Abuse/ Drug dependence)	291.0, .1, .2, .3, .4, .5, .8, .81, .82, .89, .9 303.00, .01, .02, .03, .9, .90, .91, .92, .93 305, .0, .00, .01, .02, .03 292 305.2, .20, .21, .22, .23, .3, .30, .31, .32, .33, .4, .40, .41, .42, .43, .5, .50, .51, .52, .53, .6, .60, .61, .62, .63, .7, .70, .71, .72, .73, .8, .80, .81, .82, .83, .9, .90, .91, .92, .93 304
Adjustment Disorder	309, .29, .3, .4, .82, .83, .89, .9
Bipolar Disorder	296.00, .01, .02, .03, .04, .05, .06, .10, .11, .12, .13, .14, .15, .16, .40, .41, .42, .43, .44, .45, .46, .50, .51, .52, .53, .54, .55, .56, .60, .61, .62, .63, .64, .65, .66, .7, .80, .81, .89 301.13
Anxiety State/ Anxiety Disorder	300, .00, .01, .02, .09, .20, .21, .22, .23, .29, .3 309.21, .24, .28

	313.0, .21, .22, .23
ADHD/ Learning Disorders	314.0, .00, .01, .1, .2, .8, .9 315.00, .01, .02, .09, .1, .2, .3, .31, .32, .34, .39, .4, .5, .8, .9
Conduct Disorder/ Oppositional Defiant Disorder	301.7 312.4, .8, .81, .82, .89, .9 313.81 V62.83
Eating Disorders	307.1, .50, .51, .59
Other Impulse Control Disorders	312.00, .01, .02, .03, .10, .11, .12, .13, .20, .21, .22, .23, .3, .30, .31, .32, .33, .34, .35, .39
Personality Disorders	301.0, .1, .10, .11, .12, .20, .21, .22, .3, .4, .50, .51, .59, .6, .8, .80, .81, .82, .83, .84, .89, .9
Non-Affective Psychosis	295.00, .01, .02, .03, .04, .05, .10, .11, .12, .13, .14, .15, .20, .21, .22, .23, .24, .25, .30, .31, .32, .33, .34, .35, .40, .41, .42, .43, .44, .45, .50, .51, .52, .53, .54, .60, .61, .62, .63, .64, .65, .70, .71, .72, .73, .74, .75, .80, .81, .82, .83, .84, .85, .90, .91, .92, .93, .94, .95 297.0, .1, .2, .3, .8, .9 298.0, .1, .2, .3, .4, .8, .9, .90
Somatoform/ Dissociative Disorders	300.10, .11, .12, .13, .14, .15, .16, .19, .6, .7, .80, .81, .82, .89 306.0, .1, .2, .3, .4, .50, .51, .52, .53, .59, .6, .7, .8, .9 307.54, .80, .81, .89
Organic Mental Disorders	290.0, .10, .11, .12, .13, .20, .21, .3, .40, .41, .42, .43, .8, .9 293.0, .1, .81, .82, .83, .84, .89, .89, .9 294.0, .1, .10, .11, .8, .9

	307.20, .21, .22, .23, .3 310.0, .8, .9 317 318.0, .1, 2 319
Sexual Disorders	302, .0, .1, .2, .3, .4, .50, .51, .52, .53, .6, .70, .71, .72, .73, .74, .75, .76, .79, .81, .82, .83, .84, .85, .89, .9
Sleep Disorders	307.4, .40, .41, .42, .43, .44, .45, .46, .47, .48, .49
Other Mental Disorders/ Mental Illness	292.85 299.00, .01, .10, .80, .81, .90, .91 300.9 307.0, .52, .53, .6, .7, .9 309.22 310.1 313.3, .82, .89, .9 316
Traumatic Stress	308, .0, .1, .2, .3, .4, .9
Excluded Mental Health Diagnoses	**ICD-9-CM Codes**
Postconcussion Syndrome	310.2
Tobacco Use Disorder	305.1, .10, .11, .12, .13
Symptoms, Signs, and Ill-Defined Conditions, Mental	797 798, .0, .1, .2, .9 799, .0, .01, .02, .1, .2, .21, .22, .23, .24, .25, .29, .3, .4, .8, .81, .82, .89, .9
Stressors/ Adversities	V40.0, .00, .1, .2, .20, .3, .30, .9, .90

	V61, .0, .01, .02, .03, .04, .05, .06, .07, .08, .09, .2, .20, .21, .22, .23, .24, .29, .3, .4, .41, .42, .49, .8, .9 V62, .0, .1, .1 0, .2, .20, .21, .22, .29, .3, .4, .5, .8, 80, .81, .810, .811, .812, .82, .89, .9, .90 V69.4, .5, .9
Marital Problems	V61.1, .10, .11, .12
Suicidal Ideation	V62.84
Prior History of Mental Disorders	V11.0, .1, .2, .3, .8, .80, .9, .90 V66.3 V67.3
Indicator of Impulsivity and Risky Behavior	V69.2, .3
Self-Damaging Behavior	V69.8

eTable 4. Method of Suicide Attempt by Deployment Status among Regular Army Enlisted Soldiers.[1]												
					Deployment Status							
		Total (n = 9,594)			Never Deployed (n = 5,865)			Currently Deployed (n = 932)			Previously Deployed (n = 2,797)	
		Cases (n)	%		Cases (n)	%		Cases (n)	%		Cases (n)	%
Method of Suicide Attempt[2]												
Firearm		291	3.0		56	1.0		127	13.6		108	3.9
Other		9,303	97.0		5,819	99.0		805	86.4		2,689	96.1

[1]The sample (n = 9,594 cases) includes all Regular Army enlisted soldiers (i.e., excluding those in the U.S. Army National Guard and Army Reserve) from the Army STARRS Historical Administrative Data Study (HADS) with a suicide attempt in their administrative records during the years 2004-2009. 56 cases were missing data on method of suicide attempt.

[2]Firearm includes: guns and other/unspecified firearms (excluding explosives, n = 1). Other method includes: overdose, hanging, strangulation, or suffocation; fire, steam, cold, electrocution; sharp or blunt object; jumping from high place; jumping or lying in front of a moving object; crashing a motor vehicle or aircraft; gas, vapor poisoning by vehicle exhaust; gas, vapor poisoning by utility (or other) gas; solvents, pesticides, and other agricultural chemicals; drowning; and other.

eTable 5. Counts and Rates of Suicide Attempts by Socio-Demographic and Service-Related Variables among Regular Army Enlisted Soldiers Stratified by Deployment Status.[1]

	Deployment Status																
	Never Deployed (n = 67,971)					Currently Deployed (n = 36,801)					Previously Deployed (n = 58,406)				
	Cases (n)	Total (n)[2]	Rate[3]	Pop %[4]	SRE[5]	Cases (n)	Total (n)[2]	Rate[3]	Pop %[4]	SRE[5]	Cases (n)	Total (n)[2]	Rate[3]	Pop %[4]	SRE[5]
Gender															
Male	4,068	10,072,268	485	81.1	466	717	6,495,117	133	90.5	131	2,429	9,940,429	293	89.4	290
Female	1,826	2,349,026	933	18.9	1,129	223	678,023	395	9.5	450	387	1,180,387	393	10.6	439
Age at Army Entry															
< 21	3,963	7,445,363	639	59.9	585	652	4,578,652	171	63.8	167	1,856	7,071,656	315	63.6	299
21–24	1,285	3,147,685	490	25.3	539	197	1,716,397	138	23.9	140	657	2,667,657	296	24.0	311
25+	646	1,828,246	424	14.7	541	91	878,091	124	12.2	136	303	1,381,503	263	12.4	324
Current Age															
< 21	2,880	3,445,480	1,003	27.7	662	197	809,197	292	11.3	205	238	370,238	771	3.3	404
21–24	1,880	3,608,080	625	29.1	535	406	2,541,206	192	35.4	165	1,213	3,081,413	472	27.7	329
25–29	695	2,156,095	387	17.4	462	213	1,824,613	140	25.4	143	848	3,139,048	324	28.2	294
30–34	262	1,291,062	244	10.4	475	82	974,282	101	13.6	137	291	1,974,091	177	17.8	249
35–39	119	1,121,919	127	9.0	412	30	662,630	54	9.2	94	151	1,559,951	116	14.0	241
40+	58	798,658	87	6.4	423	12	361,212	40	5.0	78	75	996,075	90	9.0	245
Race/Ethnicity															
White	4,2	7,548	675	6	65	62	4,38	17	6	16	1,9	6,42	36	5	33

		49	,049	.5	0.8	0		5	3,825	1	1.1	9		34	6,134	1	7.8	6
Black		809	2,745,209	353.6	22.1	420		161	1,496,361	129	20.9	137		445	2,730,845	196	24.6	238
Hispanic		566	1,405,366	483.3	11.3	457		104	857,504	146	12.0	135		309	1,294,309	287	11.6	271
Asian		173	505,773	410.5	4.1	421		35	295,435	142	4.1	143		78	416,278	225	3.7	230
Other		97	216,897	536.7	1.8	681		15	140,015	129	2.0	155		50	253,250	237	2.3	303
Education																		
< High School[6]		1,958	1,886,558	1,245.4	15.2	982		242	953,842	305	13.3	260		688	1,037,688	796	9.3	572
High School		3,703	9,006,103	493.4	72.5	485		646	5,628,246	138	78.5	137		2,031	8,869,631	275	79.8	274
Some College		103	697,503	177.2	5.6	366		33	315,033	126	4.4	208		55	692,055	95	6.2	161
≥ College		130	831,130	187.7	6.7	293		19	276,019	83	3.9	115		42	521,442	97	4.7	132
Marital Status																		
Never Married		4,014	6,538,614	736.7	52.6	567		388	2,883,188	162	40.2	120		1,039	3,167,639	394	28.5	283
Currently Married		1,812	5,489,812	396.1	44.2	577		518	3,999,718	155	55.8	202		1,644	7,325,244	269	65.9	316
Previously Married		68	392,868	207.7	3.2	540		34	290,234	141	4.1	181		133	627,933	254	5.6	346

eTable 5. Counts and Rates of Suicide Attempts by Socio-Demographic and Service-Related Variables among Regular Army Enlisted Soldiers Stratified by Deployment Status.[1] (continued)

	Deployment Status																
	Never Deployed (n = 67,971)					Currently Deployed (n = 36,801)					Previously Deployed (n = 58,406)				
	Cases (n)	Total (n)[2]	Rate[3]	Pop %[4]	SRE[5]	Cases (n)	Total (n)[2]	Rate[3]	Pop %[4]	SRE[5]	Cases (n)	Total (n)[2]	Rate[3]	Pop %[4]	SRE[5]
Time in Service															
1–2 Years	4,846	6,716,246	866	54.1	744	329	1,456,529	271	20.3	250	241	387,841	746	3.5	556
3–4 Years	679	1,860,079	438	15.0	429	318	2,140,718	178	29.8	167	1,281	2,819,081	545	25.3	447
5–10 Years	251	1,639,051	184	13.2	220	240	2,228,040	129	31.1	129	1,051	4,455,651	283	40.1	274
> 10 Years	118	2,205,918	64	17.8	106	53	1,347,853	47	18.8	63	243	3,458,243	84	31.1	114
Total	5,894	12,421,294	569	100.0		940	7,173,140	157	100.0		2,816	11,120,816	304	100.0	

[1]The sample of enlisted soldiers (n=9,650 cases, 153,528 control person-months) is a subset of the total sample (n=193,617 person-months) from the Army STARRS Historical Administrative Data Study (HADS) that includes all Regular Army soldiers (i.e., excluding those in the U.S. Army National Guard and Army Reserve) with a suicide attempt in their administrative records during the years 2004-2009, plus a 1:200 stratified probability sample of all other active duty Regular Army person-months in the population exclusive of soldiers with a suicide attempt or other non-fatal suicidal event (e.g., suicidal ideation) and person-months associated with death (i.e., suicides, combat deaths, homicides, and deaths due to other injuries or illnesses). All records in the 1:200 sample were assigned a weight of 200 to adjust for the under-sampling of months not associated with suicide attempt.

[2]Total includes both cases (i.e., soldiers with a suicide attempt) and control person-months.

[3]Rate per 100,000 person-years, calculated based on n_1/n_2, where n_1 is the unique number of soldiers within each category and n_2 is the annual number of person-*years*, not person-*months*, in the population (n = 3.08 million).

[4]Pop % = Population percent.

[5]SRE = Standardized risk estimate (suicide attempters per 100,000 person-years) was calculated assuming other predictors were at their sample-wide means.

[6]< High School includes: General Educational Development credential (GED), home study diploma, occupational program certificate, correspondence school diploma, high school certificate of attendance, adult education diploma, and other non-traditional high school credentials.

eTable 6. Multivariate Associations of Time Since Most Recent Mental Health Diagnosis and Number of Mental Health Diagnoses with Suicide Attempt among RegularArmy Enlisted Soldiers Stratified by Deployment Status.[1,2]

	Deployment Status					
	Never Deployed (n = 67,971)		Currently Deployed (n = 36,801)		Previously Deployed (n = 58,406)		Predictor by Deployment Status
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	
I. Recency of Mental Health Diagnoses[3]							
Depression							$\chi^2_8 = 21.2$*
No Diagnosis	1.0	–	1.0	–	1.0	–	
1 Month	10.2*	(9.3–11.2)	14.1*	(10.4–19.1)	10.6*	(9.3–12.0)	
2–3 Months	7.7*	(6.9–8.6)	9.5*	(7.1–12.7)	7.0*	(6.1–8.0)	
4–12 Months	4.0*	(3.5–4.4)	3.4*	(2.6–4.3)	3.8*	(3.4–4.4)	
13+ Months	2.2*	(1.8–2.6)	2.3*	(1.8–3.0)	2.3*	(2.0–2.6)	
χ^2_4	3,422.2*		506.3*		1,774.4*		
Posttraumatic Stress Disorder							$\chi^2_8 = 37.8$*
No Diagnosis	1.0	–	1.0	–	1.0	–	
1 Month	2.9*	(2.1–4.1)	8.1*	(4.0–16.2)	2.4*	(2.0–2.9)	
2–3 Months	1.8*	(1.2–2.9)	2.4	(1.0–5.6)	2.2*	(1.9–2.7)	
4–12 Months	0.7	(0.5–1.2)	3.4*	(2.2–5.2)	1.7*	(1.4–1.9)	
13+ Months	1.1	(0.6–1.9)	1.7	(0.9–2.9)	1.3	(1.0–1.7)	
χ^2_4	48.7*		68.5*		151.6*		
Substance Use Disorder							$\chi^2_8 = 47.1$*
No Diagnosis	1.0	–	1.0	–	1.0	–	
1 Month	4.3*	(3.8–5.0)	5.7*	(3.4–9.5)	5.1*	(4.4–6.0)	
2–3 Months	3.1*	(2.6–3.6)	2.8*	(1.6–4.8)	5.0*	(4.2–5.8)	
4–12 Months	2.3*	(2.0–2.6)	1.8*	(1.3–2.4)	3.1*	(2.7–3.6)	
13+ Months	1.9*	(1.5–2.4)	1.4*	(1.0–1.9)	2.1*	(1.8–2.4)	
χ^2_4	662.1*		68.3*		823.3*		
II. Number of the Above Diagnoses in the Previous							$\chi^2_4 = 17.4$*

Month[4]										
0		1.0	–		1.0	–		1.0	–	
1		8.8*	(8.1–9.5)		13.2*	(10.1–17.2)		9.4*	(8.5–10.4)	
2+		17.1*	(13.5–21.6)		37.1*	(20.2–68.4)		17.0*	(13.7–21.1)	
χ^2_2		3,081.0*			487.6*			2,394.9*		
III. Number of the Above Diagnoses Since Entering the Army[4]										$\chi^2_4 = 27.7$*
0		1.0	–		1.0	–		1.0	–	
1		5.4*	(5.0–5.7)		3.6*	(3.1–4.1)		4.7*	(4.3–5.2)	
2+		11.2*	(10.0–12.4)		7.0*	(5.5–8.6)		12.3*	(11.2–13.6)	
χ^2_2		3,881.3*			449.5*			2,864.3*		
IV. Recency of Any Mental Health Diagnosis[5]										$\chi^2_8 = 102.7$*
No Diagnosis		1.0	–		1.0	–		1.0	–	
1 Month		15.0*	(14.2–16.0)		29.8*	(25.0–35.5)		22.2*	(20.1–24.4)	
2–3 Months		5.2*	(4.7–5.8)		7.2*	(5.6–9.3)		7.4*	(6.5–8.5)	
4–12 Months		2.7*	(2.5–3.0)		4.5*	(3.8–5.5)		3.7*	(3.2–4.3)	
13+ Months		1.5*	(1.2–1.8)		2.2*	(1.8–2.8)		2.2*	(1.9–2.5)	
χ^2_4		8,112.8*			1,494.2*			4,471.8*		

[1]The sample of enlisted soldiers (n=9,650 cases, 153,528 control person-months) is a subset of the total sample (n=193,617 person-months) from the Army STARRS Historical Administrative Data Study (HADS) that includes all Regular Army soldiers (i.e., excluding those in the U.S. Army National Guard and Army Reserve) with a suicide attempt in their administrative records during the years 2004-2009, plus a 1:200 stratified probability sample of all other active duty Regular Army person-months in the population exclusive of soldiers with a suicide attempt or other non-fatal suicidal event (e.g., suicidal ideation) and person-months associated with death (i.e., suicides, combat deaths, homicides, and deaths due to other injuries or illnesses). All records in the 1:200 sample were assigned a weight of 200 to adjust for the under-sampling of months not associated with suicide attempt.

[2]Table sections I-IV were calculated using separate logistic regression analyses that included the variable(s) in the section and controlled for basic socio-demographic and service-related variables (gender, age at entry into the Army, current age, race/ethnicity, education, marital status, time in service). In section I the three mental health diagnoses were entered simultaneously. All analyses also included a dummy predictor variable for calendar month and year to control for secular trends.

[3]The ICD-9-CM codes that compose the Depression, Posttraumatic Stress Disorder (PTSD), and Substance Use Disorder categories are listed in eTable 3 (available online at www.armystarrs.org/publications).

[4]Number of Mental Health Diagnoses was based on a count of the following diagnostic categories: Depression, Posttraumatic Stress Disorder, Substance Use Disorder.

[5]Any Mental Health Diagnosis includes the majority of ICD-9-CM codes for mental disorders (e.g., major depression, bipolar disorder, anxiety disorder, personality disorders), but excludes postconcussion syndrome and tobacco use disorder when those were the only recorded mental health diagnoses. See eTable 3 for a complete list of included and excluded ICD-9-CM codes (available online at www.armystarrs.org/publications).

*$p < 0.05$

eTable 7. Counts and Rates of Suicide Attempts by Time Since Most Recent Mental Health Diagnosis and Number of Mental Health Diagnoses among Regular Army Enlisted Soldiers Stratified by Deployment Status.[1]

	Deployment Status																
	Never Deployed (n = 67,971)					Currently Deployed (n = 36,801)					Previously Deployed (n = 58,406)				
	Cases (n)	Total (n)[2]	Rate[3]	Pop %[4]	SRE[5]	Cases (n)	Total (n)[2]	Rate[3]	Pop %[4]	SRE[5]	Cases (n)	Total (n)[2]	Rate[3]	Pop %[4]	SRE[5]
I. Recency of Mental Health Diagnoses[6]															
Depression															
No Diagnosis	4,431	11,576,231	459	93.2	453	677	6,686,077	122	93.2	124	1,609	9,951,409	194	89.5	201
1 Month	537	109,737	5,872	0.9	4,465	57	20,857	3,279	0.3	1,873	354	124,754	3,405	1.1	2,125
2–3 Months	425	116,025	4,396	0.9	3,508	57	35,657	1,918	0.5	1,239	308	148,908	2,482	1.3	1,432
4–12 Months	375	252,775	1,780	2.0	1,827	78	143,478	652	2.0	429	323	308,323	1,257	2.8	785
13+ Months	126	366,526	413	3.0	991	71	287,071	297	4.0	300	222	587,422	454	5.3	475
Posttraumatic Stress Disorder															
No Diagnosis	5,806	12,364,606	564	99.5	567	889	7,079,889	156	98.7	152	2,326	10,709,126	264	96.3	278
1 Month	38	6,638	6,864	0.1	1,566	9	3,809	2,832	0.1	1,236	117	63,117	2,220	0.6	725
2–3 Months	21	7,021	3,588	0.1	1,001	6	5,806	1,236	0.1	384	144	83,344	2,076	0.7	636
4–12 Months	17	19,217	1,056	0.2	442	23	35,223	780	0.5	532	176	151,976	1,392	1.4	492
13+	12	23,812	600	0.2	649	13	48,413	324	0.7	252	53	113,253	564	1.0	375

Months																		
Substance Use Disorder																		
No Diagnosis		5,229	11,987,229	528	96.5	528		813	6,714,413	144	93.6	148		2,024	10,320,224	240	92.8	246
1 Month		218	51,418	5,088	0.4	2,256		18	7,418	2,916	0.1	796		176	56,176	3,756	0.5	1,238
2–3 Months		176	64,976	3,252	0.5	1,591		15	20,815	864	0.3	390		171	64,771	3,168	0.6	1,206
4–12 Months		188	129,588	1,740	1.0	1,163		44	122,044	432	1.7	270		204	153,404	1,596	1.4	761
13+ Months		83	188,083	528	1.5	987		50	308,450	192	4.3	208		241	526,241	552	4.7	512
II. Number of the Above Diagnoses in the Previous Month[7]																		
0		5,157	12,260,757	505	98.7	506		867	7,142,467	146	99.6	146		2,247	10,893,647	248	98.0	248
1		664	151,264	5,268	1.2	4,441		62	28,862	2,578	0.4	2,025		482	208,282	2,777	1.9	2,458
2+		73	9,273	9,447	0.1	7,874		11	1,811	7,289	0.0	5,899		87	18,887	5,528	0.2	4,499
III. Number of the Above Diagnoses Since Entering the Army[7]																		
0		4,067	11,221,467	435	90.3	422		594	6,266,794	114	87.4	113		1,175	9,173,575	154	82.5	153
1		1,399	1,038,399	1,617	8.4	2,272		250	748,650	401	10.4	417		903	1,492,903	726	13.4	742
2+		428	161,428	3,182	1.3	4,638		96	157,696	731	2.2	813		738	454,338	1,949	4.1	1,985

eTable 7. Counts and Rates of Suicide Attempts by Time Since Most Recent Mental Health Diagnosis and Number of Mental Health Diagnoses among Regular Army Enlisted Soldiers Stratified by Deployment Status.[1] (continued)

	Deployment Status																
	Never Deployed (n = 67,971)					Currently Deployed (n = 36,801)					Previously Deployed (n = 58,406)				
	Cases (n)	Total (n)[2]	Rate[3]	Pop %[4]	SRE[5]	Cases (n)	Total (n)[2]	Rate[3]	Pop %[4]	SRE[5]	Cases (n)	Total (n)[2]	Rate[3]	Pop %[4]	SRE[5]
IV. Any Mental Health Diagnosis[8]															
No Diagnosis	2,853	10,030,653	341	80.7	322	364	5,514,964	79	76.9	78	659	7,610,659	104	68.4	103
1 Month	1,975	445,575	5,319	3.6	4,813	222	93,222	2,858	1.3	2,383	1,319	612,119	2,586	5.5	2,340
2–3 Months	476	321,076	1,779	2.6	1,715	75	131,275	686	1.8	578	282	403,682	838	3.6	782
4–12 Months	442	673,242	788	5.4	890	165	492,965	402	6.9	363	280	823,680	408	7.4	394
13+ Months	148	950,748	187	7.7	479	114	940,714	145	13.1	178	276	1,670,676	198	15.0	228
Total	5,894	12,421,294	569	100.0		940	7,173,140	157	100.0		2,816	11,120,816	304	100.0	

[1]The sample of enlisted soldiers (n=9,650 cases, 153,528 control person-months) is a subset of the total sample (n=193,617 person-months) from the Army STARRS Historical Administrative Data Study (HADS) that includes all Regular Army soldiers (i.e., excluding those in the U.S. Army National Guard and Army Reserve) with a suicide attempt in their administrative records during the years 2004-2009, plus a 1:200 stratified probability sample of all other active duty Regular Army person-months in the population exclusive of soldiers with a suicide attempt or other non-fatal suicidal event (e.g., suicidal ideation) and person-months associated with death (i.e., suicides, combat deaths, homicides, and deaths due to other injuries or illnesses). All records in the 1:200 sample were assigned a weight of 200 to adjust for the under-sampling of months not associated with suicide attempt.

[2]Total includes both cases (i.e., soldiers with a suicide attempt) and control person-months.

[3]Rate per 100,000 person-years, calculated based on n_1/n_2, where n_1 is the unique number of soldiers within each category and n_2 is the annual number of person-*years*, not person-*months*, in the population (n = 3.08 million).

[4]Pop % = Population percent.

[5]SRE = Standardized risk estimate (suicide attempters per 100,000 person-years) was calculated assuming other predictors were at their sample-wide means. Standardized risk estimates in table sections I-IV were calculated using separate logistic regression analyses that included the variable(s) in the section and controlled for basic socio-demographic and service-related variables (gender, age at entry into the Army,

current age, race/ethnicity, education, marital status, time in service). All analyses also included a dummy predictor variable for calendar month and year to control for secular trends.

[6]The ICD-9-CM codes that compose the Depression, Posttraumatic Stress Disorder (PTSD), and Substance Use Disorder categories are listed in eTable 3 (available online at www.armystarrs.org/publications).

[7]Number of Mental Health Diagnoses was based on a count of the following diagnostic categories: Depression, Posttraumatic Stress Disorder, and Substance Use Disorder.

[8]Any Mental Health Diagnosis includes the majority of ICD-9-CM codes for mental disorders (e.g., major depression, bipolar disorder, anxiety disorder, personality disorders), but excludes postconcussion syndrome and tobacco use disorder when those were the only recorded mental health diagnoses. See eTable 3 for a complete list of included and excluded ICD-9-CM codes (available online at www.armystarrs.org/publications).

eTable 8. Multivariate Associations of Self-Reported Depression and Posttraumatic Stress Disorder (PTSD) During Post-Deployment Health Screening with Suicide Attempt among Regular Army Enlisted Soldiers with One Previous Deployment.[1,2]

	OR	95% CI	Cases (n)	Total (n)[3]	Rate[4]	Pop %[5]	SRE[6]
I. Depression (n = 10,382)[7]							
Negative Screen	1.0	–	471	1,770,271	319	85.3	287
Early Positive Screen Only	1.3	(1.0–1.8)	43	94,043	549	4.5	393
Late Positive Screen	3.0*	(2.6–3.6)	213	212,013	1,200	10.2	869
χ^2_2	175.3*						
II. PTSD (n = 10,382)[8]							
Negative Screen	1.0	–	437	1,628,237	322	78.4	287
Early Positive Screen Only	1.4*	(1.1–1.9)	59	133,459	531	6.4	414
Late Positive Screen	2.4*	(2.1–2.8)	231	314,631	876	15.2	638
χ^2_2	114.7*						
III. Either Depression or PTSD (n = 10,378)							
Negative Screen	1.0	–	347	1,486,147	280	71.6	259
Early Positive Screen Only	1.4*	(1.1–1.8)	67	169,067	476	8.1	370
Late Positive Screen	2.7*	(2.3–3.1)	313	420,800	893	20.3	689
χ^2_2	158.8*						
IV. Depression and PTSD Adjusted for Each Other (n = 10,378)[9]							
Depression							
Negative Screen	1.0	–	471	1,769,800	319	85.3	324
Early Positive Screen Only	1.2	(0.9–1.7)	43	94,000	549	4.5	412
Late Positive Screen	2.4*	(2.0–2.9)	213	211,800	1207	10.2	807
χ^2_2	88.3*						
PTSD							
Negative Screen	1.0	–	437	1,627,800	322	78.4	360
Early Positive Screen Only	1.3	(0.9–1.7)	59	133,400	531	6.4	457
Late Positive Screen	1.7*	(1.5–2.1)	231	314,400	882	15.1	586
χ^2_2	37.2*						

[1]The sample of enlisted soldiers (n=10,378) with one previous deployment who completed both the Post-deployment Health Assessment (early screen; 1-3 months post-deployment) and Post-deployment Health Reassessment (late screen; 4-6 months post-deployment) prior to their suicide attempt (cases) or sampled person-month record (controls) is a subset of the total sample (n=193,617 person-months) from the Army STARRS Historical Administrative Data Study (HADS). The total HADS sample includes all Regular Army soldiers (i.e., excluding those in the U.S. Army National Guard and Army Reserve) with a suicide

attempt in their administrative records during the years 2004-2009, plus a 1:200 stratified probability sample of all other active duty Regular Army person-months in the population exclusive of soldiers with a suicide attempt or other non-fatal suicidal event (e.g., suicidal ideation) and person-months associated with death (i.e., suicides, combat deaths, homicides, and deaths due to other injuries or illnesses). All records in the 1:200 sample were assigned a weight of 200 to adjust for the under-sampling of months not associated with suicide attempt.

[2]In separate logistic regression analyses examining each post-deployment screening variable, we controlled for basic socio-demographic and service-related variables (gender, age at entry into the Army, current age, race/ethnicity, education, marital status, time in service), and also included a dummy predictor variable for calendar month and year to control for secular trends.

[3]Total includes both cases (i.e., soldiers with a suicide attempt) and control person-months.

[4]Rate per 100,000 person-years, calculated based on n_1/n_2, where n_1 is the unique number of soldiers within each category and n_2 is the annual number of person-*years*, not person-*months*, in the population (n=3.08 million).

[5]Pop % = Population percent.

[6]SRE = Standardized risk estimate (suicide attempters per 100,000 person-years) was calculated assuming other predictors were at their sample-wide means. SREs were calculated separately for each post-deployment health screening variable based on logistic regression models that controlled for basic socio-demographic and service-related variables (gender, age at entry into the Army, current age, race/ethnicity, education, marital status, time in service), and which also included a dummy predictor variable for calendar month and year to control for secular trends.

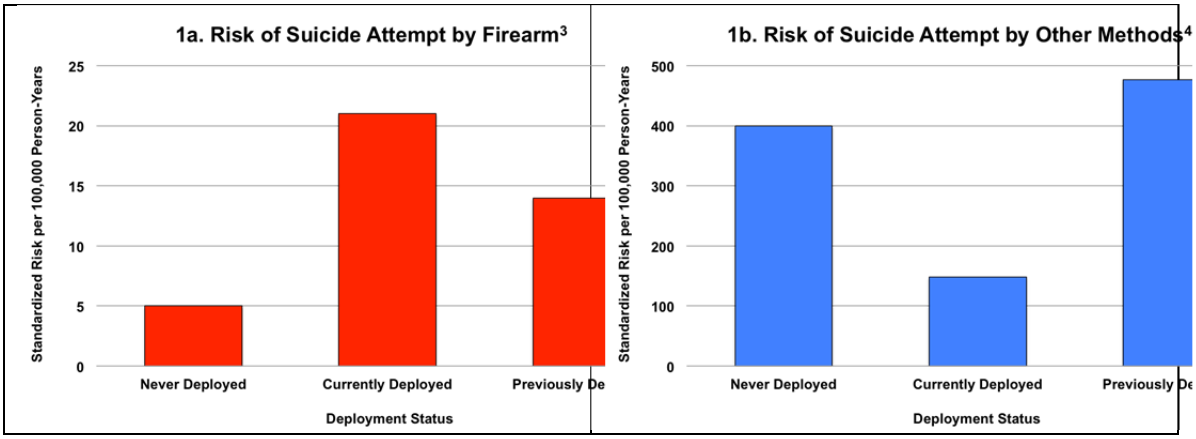
[7]Self-reported depression was assessed on the Post-deployment Health Assessment (PDHA) and Post-deployment Health Re-assessment (PDHRA) using a 2-item screening measure. Positive screens were based on endorsement of at least 1 item, consistent with DoD criteria.

[8]Self-reported Posttraumatic Stress Disorder (PTSD) was assessed on the PDHA and PDHRA using a 4-item screening measure. Positive screens were based endorsement of at least 2 items, consistent with Department of Defense (DoD) criteria.

[9]Depression and PTSD were entered simultaneously in the sample logistic regression model, controlling for basic socio-demographic and service-related variables.

*$p < 0.05$

eFigure 1. Risk of Suicide Attempt by Method and Deployment Status among Regular Army Enlisted Soldiers.[1,2]



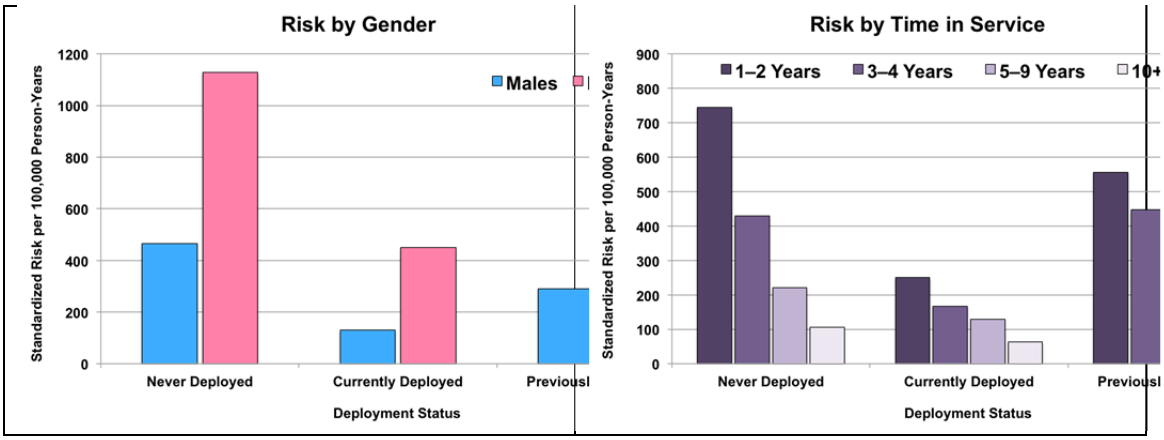
[1]The sample (n = 9,594 cases) includes all Regular Army enlisted soldiers (i.e., excluding those in the U.S. Army National Guard and Army Reserve) from the Army STARRS Historical Administrative Data Study (HADS) with a suicide attempt in their administrative records during the years 2004-2009. 56 cases were missing data on method of suicide attempt.

[2]Standardized risk estimates (suicide attempters per 100,000 person-years) assume other predictors were at their sample-wide means. Estimates were calculated based on logistic regression models that included basic socio-demographic and service-related variables (gender, age at entry into the Army, current age, race/ethnicity, education, marital status, time in service) and also included a dummy predictor variable for calendar month and year to control for secular trends.

[3]Firearm includes: guns and other/unspecified firearm (excluding explosives, n =1). Standardized rates of suicide attempt by firearm in never, currently, and previously deployed soldiers were 5, 21, and 14 per 100,000 person-years, respectively.

[4]Other method includes: overdose, hanging, strangulation, or suffocation; fire, steam, cold, electrocution; sharp or blunt object; jumping from high place; jumping or lying in front of a moving object; crashing a motor vehicle or aircraft; gas, vapor poisoning by vehicle exhaust; gas, vapor poisoning by utility (or other) gas; solvents, pesticides, and other agricultural chemicals; drowning; and other. Standardized rates of suicide attempt by other methods in never, currently, and previously deployed soldiers were 400, 148, and 477 per 100,000 person-years, respectively.

eFigure 2. Suicide Attempts by Deployment Status among Regular Army Enlisted Soldiers: Standardized Risk by Gender and Time in Service.[1,2]

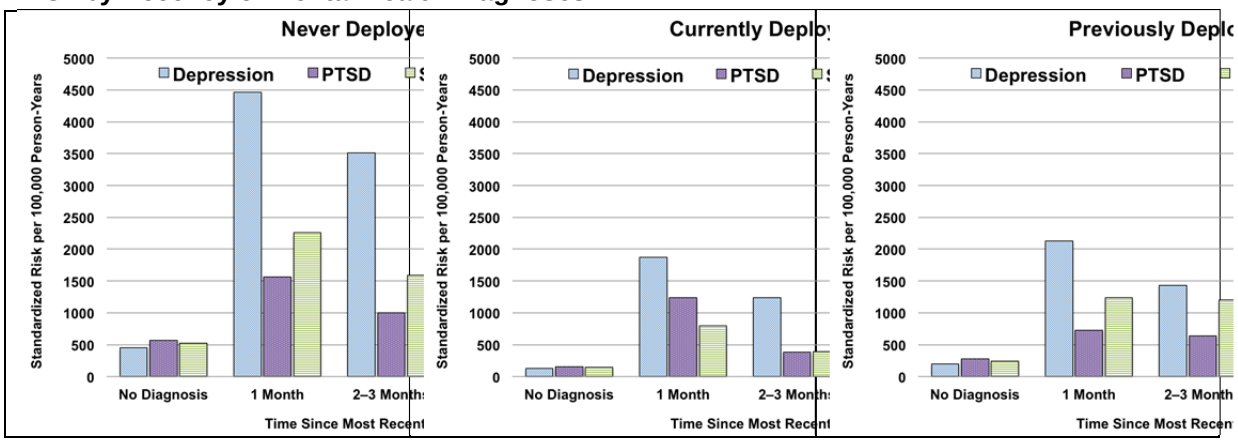


[1]The sample of enlisted soldiers (n=9,650 cases, 153,528 control person-months) is a subset of the total sample (n=193,617 person-months) from the Army STARRS Historical Administrative Data Study (HADS) that includes all Regular Army soldiers (i.e., excluding those in the U.S. Army National Guard and Army Reserve) with a suicide attempt in their administrative records during the years 2004-2009, plus a 1:200 stratified probability sample of all other active duty Regular Army person-months in the population exclusive of soldiers with a suicide attempt or other non-fatal suicidal event (e.g., suicidal ideation) and person-months associated with death (i.e., suicides, combat deaths, homicides, and deaths due to other injuries or illnesses). All records in the 1:200 sample were assigned a weight of 200 to adjust for the under-sampling of months not associated with suicide attempt.

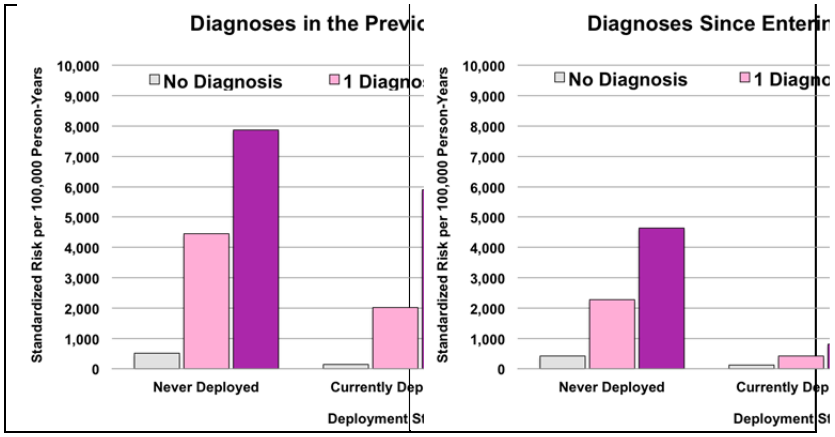
[2]Standardized risk estimates (suicide attempters per 100,000 person-years) assume other predictors were at their sample-wide means. Estimates were calculated based on logistic regression models that included basic socio-demographic and service-related variables (gender, age at entry into the Army, current age, race/ethnicity, education, marital status, time in service) and also included a dummy predictor variable for calendar month and year to control for secular trends.

eFigure 3. Standardized Risk of Suicide Attempt by Deployment Status and Mental Health Diagnosis among Regular Army Enlisted Soldiers.[1,2]

Risk by Recency of Mental Health Diagnoses[3]



Risk by Number of the Above Mental Health Diagnoses[4]



[1]The sample of enlisted soldiers (n=9,650 cases, 153,528 control person-months) is a subset of the total sample (n=193,617 person-months) from the Army STARRS Historical Administrative Data Study (HADS) that includes all Regular Army soldiers (i.e., excluding those in the U.S. Army National Guard and Army Reserve) with a suicide attempt in their administrative records during the years 2004-2009, plus a 1:200 stratified probability sample of all other active duty Regular Army person-months in the population exclusive of soldiers with a suicide attempt or other non-fatal suicidal event (e.g., suicidal ideation) and person-months associated with death (i.e., suicides, combat deaths, homicides, and deaths due to other injuries or illnesses). All records in the 1:200 sample were assigned a weight of 200 to adjust for the under-sampling of months not associated with suicide attempt.

[2]Standardized risk estimates (suicide attempters per 100,000 person-years) assume other predictors were at their sample-wide means. Estimates were calculated based on logistic regression models that included basic socio-demographic and service-related variables (gender, age at entry into the Army, current age, race/ethnicity, education, marital status, time in service) and also included a dummy predictor variable for calendar month and year to control for secular trends.

[3]The ICD-9-CM codes that compose the Depression, Posttraumatic Stress Disorder (PTSD), and Substance Use Disorder categories are listed in eTable 3.

[4]Number of Mental Health Diagnoses was based on a count of the following diagnostic categories: Depression, Posttraumatic Stress Disorder, and Substance Use Disorder. Standardized risk estimates for Number of Mental Health Diagnoses were calculated based on logistic regression models that adjusted for basic socio-demographic and service-related variables (gender, age at entry into the Army, current age,

race/ethnicity, education, marital status, time in service), and which also included a dummy predictor variable for calendar month and year to control for secular trends.

eAppendix. Supplemental Methods and Results:

METHODS

Sample

Creation and analysis of the Army STARRS consolidated and deidentified data system were approved by the Institutional Review Boards of the Uniformed Services University of the Health Sciences for the Henry M. Jackson Foundation (the primary grantee), the University of Michigan Institute for Social Research (site of the Army STARRS Data Enclave), University of California, San Diego and Harvard Medical School, which determined that the present study did not constitute human participant research because it relies entirely on deidentified secondary data.

This longitudinal, retrospective cohort study used data from the Army STARRS Historical Administrative Data Study (HADS), which integrates 38 Army/DoD administrative data systems, including every system in which suicidal events are medically documented. It includes individual-level person-month records for all soldiers on active duty between January 1, 2004 and December 31, 2009 (n=1.66 million).[1] In selecting our analytic sample we began by identifying records for the 975,057 Regular Army soldiers on active duty during the HADS study period (excluding activated Army National Guard and Army Reserve), 9,791 of whom had a documented suicide attempt. Data were analyzed using a discrete-time survival framework with person-month as the unit of analysis,[2] such that each month in the career of a soldier was treated as a separate observational record. Given that discrete-time survival coefficients can be estimated without bias when control person-months are randomly subsampled and weighted using the logic of case–control analysis,[3] we reduced computational intensity by selecting from

the population an equal-probability 1:200 sample of control person-months stratified by gender, rank, time in service, deployment status (never, currently, or previously deployed), and historical time (*n*=183,826). Control person-months excluded all soldiers with a documented suicide attempt or other non-fatal suicidal event (e.g., suicidal ideation)[4] and person-months in which a soldier died due to suicide, combat, homicide, injury, or illness. The full case-control analytic sample contained 193,617 person-months, with each control person-month assigned a weight of 200 to adjust for the under-sampling of months without a suicide attempt. The present study focused on the subset of Regular Army enlisted soldiers (excluding officers), who accounted for nearly 99% of suicide attempts from 2004 through 2009.[5] The final analytic sample included all enlisted soldiers who attempted suicide (*n*=9,650 cases) and 153,528 control person-months.

Measures

Suicide attempt. Soldiers who attempted suicide were identified using Army/DoD administrative records from: the Department of Defense Suicide Event Report (DoDSER),[6] a DoD-wide surveillance mechanism that aggregates information on suicidal behaviors via a standardized form completed by medical providers at DoD treatment facilities; and ICD-9-CM diagnostic codes E950-E958 (indicating self-inflicted poisoning or injury with suicidal intent) from the Military Health System Data Repository (MDR), Theater Medical Data Store (TMDS), and TRANSCOM (Transportation Command) Regulating and Command and Control Evacuating System (TRAC^{2}ES), which together provide healthcare encounter information from military and civilian treatment facilities, combat operations, and aeromedical evacuations (eTable 1, available online at www.armystarrs.org/publications). We excluded suicide deaths and DoDSER

records indicating only suicide ideation. The E959 code (late effects of a self-inflicted injury) was excluded, as it confounds the temporal relationships between the predictor variables and suicide attempt.[7] Records from different data systems were cross-referenced to ensure all cases represent unique soldiers. For soldiers with multiple suicide attempts, we selected the first attempt using a hierarchical classification scheme that prioritized DoDSER records due to that system's more extensive reporting requirements.[4] DoDSER and ICD-9-CM E950-E958 diagnostic codes also provided information on method of suicide attempt, which was organized into two categories: firearms (excluding explosives, *n*=1) and other methods (e.g., overdose [medication, drugs, alcohol poisoning]; hanging, electrocution, sharp or blunt object, jumping crashing a motor vehicle, poisoning by vehicle exhaust, drowning) (eTable 2).

Predictors. Socio-demographic, service-related, and mental health diagnosis variables were also drawn from Army/DoD administrative data available in the HADS (eTable 1). We used ICD-9-CM codes to identify previous diagnoses of depression, posttraumatic stress disorder (PTSD), and substance use disorder (SUD) (eTable 3). We also created an indicator variable or any previous mental health diagnosis (e.g., depression, PTSD, SUD, bipolar disorder, psychotic disorders personality disorders, etc.), excluding postconcussion syndrome, tobacco use disorder, and supplemental V-codes that are not disorders (e.g., stressors/adversities, marital problems) when those were the only recorded mental health diagnoses (eTable 3). Among soldiers with a history of mental health diagnosis, recency of diagnosis was determined based on the number of months elapsed since the most recent diagnostic record (no diagnosis vs. 1 month, 2-3 months, 4-12 months, and 13+ months since most recent diagnosis). We included mental

health diagnostic codes in any position recorded during any medical encounter. To examine self-reported depression and PTSD following deployment, we used heath screening data from the Post-Deployment Health Assessment (PDHA; administered just prior to or immediately after return) and Post-Deployment Health Reassessment (PDHRA; administered 3-6 months after return).[8,9] Self-reported depression was assessed using a 2-item screening measure, with a positive screens based on endorsement of at least 1 item, consistent with DoD criteria. Self-reported PTSD was assessed using a 4-item screening measure, with a positive screen based endorsement of at least 2 items, consistent with DoD criteria. We included only soldiers who completed both assessments and we used a time frame of one month before to three months after return for the PDHA and 4-6 months after return for the PDHRA, as this captured most screening data.

Analysis

All analyses were conducted using SAS version 9.3.[10] To examine the association of deployment status (never, currently, previously deployed to Afghanistan or Iraq) with method of suicide attempt, we used an overall data array in which separate data files for method of attempt (firearm, other) were stacked and distinguished by dummy variables. The stacked sample was then modeled with a two-way interaction between deployment status and sample (i.e. "group") using a logistic regression analysis that controlled for socio-demographic and service-related variables (gender, age at Army entry, current age, race, education, marital status, time in service).

To examine multivariate associations of basic socio-demographic and service-related variables with suicide attempt, separate logistic regression analyses were conducted within groups of enlisted soldiers stratified by deployment status. We then

controlled for these basic variables in separate models examining the incremental predictive effects of depression, PTSD, and SUD diagnoses, the number of those diagnoses in previous month and since entering service, and any previous mental health diagnosis. Using the subset of enlisted soldiers with one previous deployment who completed both the PDHA and PDHRA prior to their person-month record, we examined the effects of screening positive for PTSD or depression either early (PDHA) or late (PDHRA). Logistic regression coefficients were exponentiated to obtain odds-ratios (OR) and 95% confidence intervals (CI). Final model coefficients were used to generate *standardized* estimates of risk[11] (number of suicide attempters per 100,000 person-years) for each category of each predictor under the model assuming other predictors were at their sample-wide means. All logistic regression models included a dummy predictor for calendar month and year to control for increasing rates of suicide attempt from 2004 through 2009.[4] Coefficients of other predictors can consequently be interpreted as averaged within-month associations based on the assumption that effects of other predictors do not vary over time.

We used discrete-time hazard functions and linear spline models to examine risk of suicide attempt as a function of time and deployment status. Analyses estimated risk by (i) months since entering service among those never deployed, (ii) months since deploying among those currently on their first deployment, and (iii) months since returning from first deployment among those with one previous deployment. Using the subset of previously deployed soldiers who had deployed exactly once and completed both the PDHA and PDHRA, we examined risk of suicide attempt as function of time and a positive PTSD and/or depression screen. Splines (piecewise linear functions) were

calculated based on the hazard rates to assess changes in risk by time in service. After fitting a single linear function to the data in each group, we used chi-square difference tests, deviance, and the Akaike Information Criterion (AIC) to test whether knots and additional linear segments improved model fit.

RESULTS

The 40.4% of enlisted soldiers who had never deployed accounted for 61.1% of enlisted suicide attempters (rate: 569 per 100,000 person-years), followed by the 36.2% enlisted soldiers who had previously deployed (29.2% of enlisted attempters; rate: 304 per 100,000 person-years) and the 23.4% of enlisted soldiers who were currently deployed (9.7% of enlisted attempters; rate: 157 per 100,000 person-years) (Figure 1). Firearms were used by 1.0%, 13.6%, and 3.9% of attempters who were never, currently, and previously deployed, respectively (eTable 4). Among the 97.0% of attempters who used other methods, overdose was the most common (52.2-56.9%). Deployment status was associated with both suicide attempts by firearm (χ^2_2=65.4, p<0.0001) and by other methods (χ^2_2=895.6, p<0.0001), and the interaction of deployment status by method of suicide attempt was significant (χ^2_2=222.5, p<0.0001). Odds of a suicide attempts by firearm were higher among soldiers who were currently deployed (OR=4.0 [95% CI: 2.9-5.6]) and previously deployed (OR=2.7 [95% CI: 1.8-3.9]) than never deployed. Previously deployed soldiers had lower odds of a suicide attempt by firearm than those currently deployed (OR=0.7 [95% CI: 0.5-0.9]). Currently deployed soldiers had lower odds of making a suicide attempt using other methods than soldiers who were never deployed (OR=0.4 [95% CI: 0.3-0.4]) or previously deployed (OR=0.3 [95% CI: 0.3-

0.3]). Previously deployed soldiers had higher odds of attempting suicide by other methods than never deployed soldiers (OR=1.2 [95% CI: 1.1-1.3]) (eFigure 1).

Predictors of suicide attempt by deployment status

Standardized risk estimates were typically highest among those never deployed and lowest among those currently deployed for all individual socio-demographic, service related, and mental health risk factors (Table 1, eTables 5-8, eFigure 2).

Gender. Female enlisted soldiers were consistently more likely than males to attempt suicide and the association of gender differed by deployment status (χ^2_1=80.1, p<0.0001). Risk among males was highest in those never deployed (466 per 100,000 person-years), followed by those previously (290 per 100,000 person-years) and currently (131 per 100,000 person-years) deployed. Standardized risk among enlisted females was also highest in those never deployed (1,129 per 100,000 person-years) and comparably lower in those currently or previously deployed (450 and 439 per 100,000 person-years, respectively).

Age at Army entry. Although the association of age at Army entry with suicide attempt varied significantly by deployment status (χ^2_4=29.6, p<0.0001), its associations within deployment status were nonsignificant (χ^2_2=1.5-3.1, p=0.22-0.47).

Current age. Associations of current age with suicide attempt were significant within all deployment status groups (χ^2_5=11.8-36.3, p<0.0001-0.038) and differed across groups (χ^2_{10}=79.5, p<0.0001). Never and previously deployed soldiers younger than 21-years-old had the highest odds relative to those age 30-34 (ORs=1.4-1.8). Odds were also highest, but nonsignificant, among currently deployed soldiers under age 21 (OR=1.5; 95% CI: 1.0-2.3). Standardized risk in all deployment strata generally decreased as age

increased. Never deployed soldiers had 3.2-5.4 times the risk of currently deployed and 1.6-1.9 times the risk previously deployed in the same age group.

Race/ethnicity. Race/ethnicity was the only basic predictor that did not vary significantly by deployment status (χ^2_8=9.0, p=0.35). Never and previously deployed soldiers who were Black, Hispanic, or Asian were less likely to attempt suicide than Non-Hispanic White soldiers (ORs=0.7-0.8), whereas there was no association among those currently deployed (χ^2_4=7.9, p=0.10). Standardized risk among Non-Hispanic White soldiers who were never deployed were 1.9-3.8 times higher than currently and previously deployed soldiers of the same race/ethnicity.

Education. The association of education with suicide attempt differed by deployment status (χ^2_6=22.1, p=0.001). Soldiers in all strata with less than a high school education had increased odds relative to those with a high school diploma (ORs=1.8-2.0). Never and previously deployed soldiers with any level of college education had lower odds (ORs=0.5-0.7), while odds were higher for currently deployed soldiers who attended college but did not complete a four-year degree (OR=1.5; 95% CI: 1.0-2.1). Never deployed soldiers without a high school diploma were at greatest risk, with a standardized rate 1.7-3.8 times that of currently and previously deployed soldiers with the same education level, and 2.0-8.6 times higher than more educated soldiers with any deployment status.

Marital status. Compared to currently married soldiers, suicide attempt was less likely in never married soldiers if they were currently deployed (OR=0.6; 95% CI: 0.5-0.7). The association of marital status differed by deployment status (χ^2_4=49.5, p<0.0001) and was nonsignificant among those never or previously deployed (χ^2_2=0.4–5.1, p=0.08-

0.82). Never deployed soldiers had a standardized risk 2.9-4.7 times higher than currently deployed soldiers and 1.6-2.0 times higher than previously deployed soldiers with a corresponding marital status.

Time in service. The association of time in service was significant in all deployment status groups (never deployed, χ^2_3=334.5, p<0.0001; currently deployed, χ^2_3=40.1, p<0.0001; previously deployed, χ^2_3=185.3, p<0.0001), with odds decreasing monotonically as time in service increased. Compared to enlisted soldiers with 5-10 years of service, attempts were more likely among those who had served for 1-2 years (never deployed, OR=3.1 [95% CI: 2.7-3.6]; currently deployed, OR=1.9 [95% CI: 1.5-2.3]; previously deployed, OR=2.2 [1.9-2.7]) or 3-4 years (never deployed, OR=1.8 [95% CI: 1.6-2.1]; currently deployed, OR=1.3 [95% CI: 1.1-1.6]; previously deployed, OR=1.7 [1.5-1.9]), and less likely among those beyond their 10th year (never deployed, OR=0.5 [95% CI: 0.4-0.7]; currently deployed, OR=0.5 [95% CI: 0.3-0.8]; previously deployed, OR=0.4 [0.4-0.5]). The association of time in service varied significantly by deployment status (χ^2_6=25.6, p<0.001). Standardized risk was higher among never deployed soldiers (744 per 100,000 person-years [1-2 years of service] to 106 per 100,000 person-years [>10 years of service]) previously deployed (556 per 100,000 person-years [1-2 years of service] to 114 per 100,000 person-years [>10 years of service]) soldiers than those currently deployed (250 per 100,000 person-years [1-2 years of service] to 63 per 100,000 person-years [>10 years of service]) with the same time in service.

Mental health diagnosis. Controlling for socio-demographic and service-related covariates, a history of any mental health diagnosis was associated with suicide attempt in all deployment status groups (never deployed, χ^2_4=8,112.8, p<0.0001; currently

deployed, χ^2_4=1,494.2, p<0.0001; previously deployed, χ^2_4=4,471.8, p<0.0001). Soldiers whose most recent diagnosis was in the previous month had the highest odds of attempt relative to those with no diagnosis (never deployed, OR=15.0 [95% CI: 14.2-16.0]; currently deployed, OR=29.8 [95% CI: 25.0-35.5]; previously deployed, OR=22.2 [20.1-24.4]). Odds among soldiers with a less recent diagnosis were also significantly elevated but decreased monotonically as time since the most recent diagnosis increased from 2-3 months (never deployed, OR=5.2 [95% CI: 4.7-5.8]; currently deployed, OR=7.2 [95% CI: 5.6-9.3]; previously deployed, OR=7.4 [6.5-8.5]) to 4-12 months (never deployed, OR=2.7 [95% CI: 2.5-3.0]; currently deployed, OR=4.5 [95% CI: 3.8-5.5]; previously deployed, OR=3.7 [3.2-4.3]) to 13 months or more (never deployed, OR=1.5 [95% CI: 1.2-1.8]; currently deployed, OR=2.2 [95% CI: 1.8-2.8]; previously deployed, OR=2.2 [1.9-2.5]). The association between suicide attempt and presence/recency of any mental health diagnosis differed by deployment status (χ^2_8=102.7, p<0.0001). Never deployed soldiers with a diagnosis in the previous month were at greatest risk, with a standardized risk estimate (4,813 per 100,000 person-years) twice that of currently or previously deployed soldiers with a comparably recent diagnosis (2,383 and 2,340 per 100,000 person-years, respectively) (Figure 2, eTables 6 and 7).

Results were similar for recency of depression (never deployed, χ^2_4=3,422.2, p<0.0001; currently deployed, χ^2_4=506.3, p<0.0001; previously deployed, χ^2_4=1,774.4, p<0.0001), PTSD (never deployed, χ^2_4=48.7, p<0.0001; currently deployed, χ^2_4=68.5, p<0.0001; previously deployed, χ^2_4=151.6, p<0.0001), and SUD (never deployed, χ^2_4=662.1, p<0.0001; currently deployed, χ^2_4=68.3, p<0.0001; previously deployed,

χ^2_4=823.3, p<0.0001) diagnosis when entered together in a logistic regression model that controlled for socio-demographic and service-related covariates.

Relative to those with no history of depression diagnosis, soldiers who most recently received a depression diagnosis in the previous month had the highest odds of suicide attempt (never deployed, OR=10.2 [95% CI: 9.3-11.2]; currently deployed, OR=14.1 [95% CI: 10.4-19.1]; previously deployed, OR=10.6 [95% CI: 9.3-12.0]), with decreasing odds as the recency of diagnosis decreased from 2-3 months (never deployed, OR=7.7 [95% CI: 6.9-8.6]; currently deployed, OR=9.5 [95% CI: 7.1-12.7]; previously deployed, OR=7.0 [95% CI: 6.1-8.0]) to 4-12 months (never deployed, OR=4.0 [95% CI: 3.5-4.4]; currently deployed, OR=3.4 [95% CI: 2.6-4.3]; previously deployed, OR=3.8 [95% CI: 3.4-4.4]) to 13 or more months (never deployed, OR=2.2 [95% CI: 1.8-2.6]; currently deployed, OR=2.3 [95% CI: 1.8-3.0]; previously deployed, OR=2.3 [95% CI: 2.0-2.6]). The associations of depression (χ^2_8=21.2, p=0.007), PTSD (χ^2_8=37.8, p<0.0001), and SUD (χ^2_8=47.1, p<0.0001) differed by deployment status. The odds associated with a diagnosis in the previous month were highest for both PTSD (never deployed, OR=2.9 [95% CI: 2.1-4.1]; currently deployed, OR=8.1 [95% CI: 4.0-16.2]; previously deployed, OR=2.4 [95% CI: 2.0-2.9]) and SUD (never deployed, OR=4.3 [95% CI: 3.8-5.0]; currently deployed, OR=5.7 [95% CI: 3.4-9.5]; previously deployed, OR=5.1 [95% CI: 4.4-6.0]), compared to those without each diagnosis. Never deployed soldiers with a diagnosis of PTSD or SUD in the previous month were at greatest risk, with standardized risk estimates (1,566 and 2,256 per 100,000 person-years, respectively) that exceeded those of currently deployed (1,236 and 796 per 100,000 person-years,

respectively) or previously deployed soldiers (725 and 1,238 per 100,000 person-years, respectively) with a comparably recent diagnosis (eTables 6-7, eFigure 3).

In a separate logistic regression model, the odds of suicide attempt increased as the number of these diagnoses (depression, PTSD, and SUD) in the previous month increased from one (never deployed, OR=8.8 [95% CI: 8.1-9.5]; currently deployed, OR=13.2 [95% CI: 10.1-17.2]; previously deployed, OR=9.4 [95% CI: 8.5-10.4]) to two or more (never deployed, OR=17.1 [95% CI: 13.5-21.6]; currently deployed, OR=37.1 [95% CI: 20.2-68.4]; previously deployed, OR=17.0 [95% CI: 13.7-21.1]), compared to those without one of those diagnoses. This association varied by deployment status (χ^2_4=17.4, p=0.002). Standardized risk of suicide attempt for soldiers with two or more of these diagnoses in the previous month (never deployed, 7,874 per 100,000 person years; currently deployed, 5,899 per 100,000 person-years; previously deployed, 4,499 per 100,000 person-years) was much greater than those with one diagnosis in the previous month (never deployed, 4,441 per 100,000 person years; currently deployed, 2,025 per 100,000 person-years; previously deployed, 2,458 per 100,000 person-years) and lowest for those with no history of those diagnoses since entering Army service (never deployed, 506 per 100,000 person years; currently deployed, 146 per 100,000 person-years; previously deployed, 248 per 100,000 person-years) (eTables 6-7, eFigure 3).

The patterns was similar for number of diagnoses since entering Army service, with odds increasing from one diagnosis (never deployed, OR=5.4 [95% CI: 5.0-5.7]; currently deployed, OR=3.6 [95% CI: 3.1-4.1]; previously deployed, OR=4.7 [95% CI: 4.3-5.2]) to two or more (never deployed, OR=11.2 [95% CI: 10.0-12.4]; currently deployed, OR=7.0 [95% CI: 5.5-8.6]; previously deployed, OR=12.3 [95% CI: 11.2-

13.6]). This association also varied by deployment status (χ^2_4=27.7, p<0.0001). Standardized risk of suicide attempt for soldiers with two or more of these diagnoses since entering Army service (never deployed, 4,638 per 100,000 person years; currently deployed, 813 per 100,000 person-years; previously deployed, 1,985 per 100,000 person-years) was much higher than for those with one diagnosis (never deployed, 2,272 per 100,000 person years; currently deployed, 417 per 100,000 person-years; previously deployed, 742 per 100,000 person-years) and lowest for those with no history of diagnosis since entering Army service (never deployed, 422 per 100,000 person years; currently deployed, 113 per 100,000 person-years; previously deployed, 153 per 100,000 person-years) (eTables 6-7, eFigure 3).

Post-deployment health screening. Among soldiers with one previous deployment, those who screened positive for either depression or PTSD only during the early post-deployment health screening on the PDHA had elevated odds of suicide attempt compared to those who screened negative (OR=1.4 [95% CI: 1.1–1.9]), but odds were highest among those with a late positive screen on the PDHRA (OR=2.4 [95% CI: 2.1–2.8]). Standardized risk estimates for soldiers with a negative screen, early positive screen only, and late positive screen for depression or PTSD were 287, 393, and 869 per 100,000 person-years, respectively. Examined simultaneously in the same model, both depression (χ^2_2=88.3, p<0.0001) and PTSD (χ^2_2=37.2, p<0.0001) were associated with suicide attempt. Soldiers with a late positive depression screen were more likely to attempt than those with a negative depression screen (OR=2.4 [95% CI: 2.0-2.9]), whereas the odds among those with only an early positive depression screen were not significantly elevated (OR=1.2 [95% CI: 0.9-1.7]). Adjusting for PTSD screening,

standardized risk estimates associated with a negative, early positive only, and late positive depression screen were 324, 412, and 897 per 100,000 person-years, respectively. Similarly, odds were higher among soldiers with a late positive PTSD screen relative to those with a negative screen (OR=1.7 [95% CI: 1.5-2.1]) but not significantly higher among those with only an early positive PTSD screen (OR=1.3 [95% CI: 0.9-1.7]). Adjusting for depression screening, standardized risk estimates associated with a negative, early positive only, and late positive PTSD screen were 360, 457, and 586 per 100,000 person-years, respectively (eTable 8).

Monthly risk of first suicide attempt by deployment status

Hazard functions revealed variations in monthly suicide attempt risk by deployment status. Enlisted soldiers who had never deployed (Figure 4a) were at greatest risk in the second month of service (103 per 100,000 person-months). Spline analyses indicated that adding knots at the second and third months provided the best fit. Additional knots did not significantly improve model fit, suggesting that risk among never deployed enlisted soldiers increases sharply in the second month of service, followed by a sharp decrease in the third month, then increases again at a more gradual and constant rate through the end of the first year of service.

The median deployment length was 12 months, with 75% of having a deployment 11-15 months long. Among enlisted soldiers currently on their first deployment (Figure 4b), risk of suicide attempt was highest in the sixth month after being deployed (25 per 100,000 person-months). Spline analyses suggested that adding a knot at the sixth month provided the best fit, with no improvement in fit achieved by adding other knots. Thus, risk of suicide attempt among soldiers on their first deployment increases at a constant

rate until the sixth month, followed by constant and more gradual decline in risk over the remaining months.

Among enlisted soldiers who have returned from their first deployment (Figure 4c), risk of suicide attempt peaks around the fifth month (40 per 100,000 person-months). Spline analyses revealed that placing a knot at the fifth month provided optimal fit, with no further improvement gained through additional knots. These analyses suggest that risk of first suicide attempt increases sharply over the first five months after returning from deployment, followed by a long constant decrease over time.

Among soldiers with one previous deployment who completed both the PDHA and PDHRA, hazard functions revealed that suicide attempt risk was highest for those with a late positive screen for depression or PTSD on the PDHRA (62 to 107 per 100,000 person-months). Hazard rates were substantially lower for those with only an early positive screen on the PDHA (21 to 66 per 100,000 person-months), and lowest for those who screened negative for either disorder (19 to 29 per 100,000 person-months). Spline analyses indicated that a single piecewise linear function provided the best fit for each group, with risk decreasing as months since returning from deployment increased. Risk among soldiers who screened negative or only had an early positive screen declined slightly between 4 and 24 months post-deployment, whereas there was a sharper decline in risk among those with a late positive screen (Figure 3).

eREFERENCES

1. Kessler RC, Colpe LJ, Fullerton CS, et al. Design of the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *Int. J. Methods Psychiatr. Res.* 2013;22(4):267-275.

2. Willett JB, Singer JD. Investigating onset, cessation, relapse, and recovery: why you should, and how you can, use discrete-time survival analysis to examine event occurrence. *J. Consult. Clin. Psychol.* Dec 1993;61(6):952-965.

3. Schlesselman JJ. *Case-control studies: Design, conduct, analysis.* New York, NY: Oxford University Press; 1982.

4. Ursano RJ, Kessler RC, Heeringa SG, et al. Nonfatal suicidal behaviors in U.S. Army administrative records, 2004–2009: Results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *Psychiatry.* 2015;78:1-21.

5. Ursano RJ, Kessler RC, Stein MB, et al. Suicide Attempts in the U.S. Army during the wars in Afghanistan and Iraq, 2004–2009. *JAMA Psychiatry.* 2015:in press. Epub ahead of print.

6. Gahm GA, Reger MA, Kinn JT, Luxton DD, Skopp NA, Bush NE. Addressing the surveillance goal in the National Strategy for Suicide Prevention: The Department of Defense Suicide Event Report. *Am. J. Public Health.* 2012;102(Suppl 1):S24-S28.

7. Walkup JT, Townsend L, Crystal S, Olfson M. A systematic review of validated methods for identifying suicide or suicidal ideation using administrative or claims data. *Pharmacoepidemiol. Drug Saf.* 2012;21(Suppl 1):174-182.

8. Appenzeller GN, Warner CH, Grieger T. Postdeployment health reassessment: A sustainable method for brigade combat teams. *Mil. Med.* 2007;172(10):1017-1023.

9. Warner CH, Breitbach JE, Appenzeller GN, Yates V, Grieger T, Webster WG. Division mental health in the new brigade combat team structure: Part II. Redeployment and postdeployment. *Mil. Med.* 2007;172(9):912-917.

10. SAS Institute Inc. *SAS® 9.3 Software.* Cary, NC: SAS Institute Inc.; 2011.

11. Roalfe AK, Holder RL, Wilson S. Standardisation of rates using logistic regression: A comparison with the direct method. *BMC Health Serv. Res.* 2008;8:275.